Dr. Edoardo **Milana**

Postdoctoral Research Associate

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Education

KU Leuven *Leuven (BE)*

PhD in Engineering Science - Mechanical Engineering *2016 - 2020*

- Dissertation: *Biomimetic ciliary propulsion. Soft robotic actuation and morphological control*
- Advisors: Prof. Dominiek Reynaerts, Prof. Michael De Volder, Prof. Benjamin Gorissen
- Visiting Reseacher at the Interdisciplinary Centre of Excellence for Nanostructured Materials and Interfaces of the University of Milan under the supervision of Prof. Paolo Milani (2019)

Sapienza Università di Roma *Rome (IT)*

MSc in Nanotechnology Engineering *2013 - 2015*

- 110/110 *cum laude*
- Master's thesis: *Conducting PDMS nanocomposite sensing pneumatic microactuators*
- Advisor: Prof. Antonio Carcaterra

Sapienza Università di Roma *Rome (IT)*

BSc in Mechanical Engineering *2009 - 2012*

- 105/110

Professional Experience

2023-now	**Postdoctoral Research Associate**, livMatS @ FIT, Albert-Ludwigs-Universität Freiburg (DE)
2020-2022	**Research Scientist**, Institute for the Protection of Terrestrial Infrastructures, German Aerospace Center - DLR (DE)
2016-2020	**Research and Teaching Assistant**, Department of Mechanical Engineering, KU Leuven (BE)
2015-2016	**Research Engineer**, LPICM, Ecole Polytechnique (FR)

Awards, Fellowships, & Grants

2022	**Walter Benjamin Programme**, German Research Foundation - DFG (DE)	*200,600 €*
2022	**Freiburg Rising Star**, Albert-Ludwigs-Universität Freiburg (DE)	
2022	**Conference Grant to IEEE RoboSoft 2022**, Research Foundation Flanders - FWO (BE)	
2021	**Best Communication Paper Award**, IEEE International Conference in Soft Robotics (US)	
2019	**Travel Grant to University of Milan**, Research Foundation Flanders - FWO (BE)	*5000 €*
2013	**Erasmus Grant to KU Leuven**, Sapienza Università di Roma (IT)	*3000 €*

Professional Service

Reviewer

Soft Robotics, IEEE Robotics and Automation Letters, Robotics and Autonomous Systems, Micromachines, Biomimetics, Frontiers in Robotics and AI, Sensors and Actuators: A. Physical, Ocean Engineering, IEEE International Conference on Soft Robotics, IEEE International Conference on Robotics and Automation

Professional Memberships

European Society for Precision Engineering and Nanotechnology (EUSPEN)

Teaching Experience

Teaching Assistant

Fall 2020 **Problem Solving and Design: Soft Robotics**, KU Leuven (BE)
2019-2020 **Problem Solving and Design: Industrial project**, KU Leuven (BE)
Fall 2019 **Problem Solving and Design: Soft Robotics**, KU Leuven (BE)
2018-2019 **Problem Solving and Design: Industrial project**, KU Leuven (BE)
Fall 2018 **Problem Solving and Design: Soft Robotics**, KU Leuven (BE)
2017-2018 **Problem Solving and Design: Industrial project**, KU Leuven (BE)
2016-2017 **Problem Solving and Design: Industrial project**, KU Leuven (BE)

Mentoring

Fall 2022 **Fynn Pieper**, Mechanical Engineering, TU Hamburg (DE)
Fall 2022 **Gioele Buriani**, Robotics, TU Delft (NL)
2019-2020 **Sean Flaherty**, Mechanical Engineering, KU Leuven (BE)
2019-2020 **Joost Jennen**, Mechanical Engineering, KU Leuven (BE)
Fall 2019 **Nithin Johnson**, AI and Robotics, Sapienza Università di Roma (IT)
Fall 2019 **Paolo Azzini**, Physics, Università degli Studi di Milano (IT)
2018-2019 **Eline De Borre**, Nanotechnology Engineering, KU Leuven (BE)
Spring 2018 **Andrea Serrano**, Mechanical Engineering, KU Leuven (BE)
2017-2018 **Bert Van Raemdonck**, Mechanical Engineering, KU Leuven (BE)

Presentations

Invited Talks and Seminars

2022. *Bioinspired Soft Machines: a journey across multiple scales*. Invited talk: livMatS @ FIT, University of Freiburg, Freiburg (DE)

2022. *Liquid Crystal Elastomers and force generation in Soft Machines*. Guest lecture: livMatS @ FIT, University of Freiburg, Freiburg (DE)

2022. *Analog gauge reader for infrastructure robotics*. Institute seminar: Institute for the Protection of Terrestrial Infrastructures, German Aerospace Center - DLR, Sankt Augustin (DE)

2022. *When soft robots meet metamaterials*. Invited talk: Freiburg Rising Stars Conference, Univeristy of Freiburg, Freiburg (DE)

2020. *Biomimetic ciliary propulsion. Soft robotic actuation and morphological control*. Public PhD defense: Department of Mechanical Engineering, KU Leuven, Leuven (BE)

2020. *Biomimetic ciliary propulsion with soft robotic microactuation*. Institute seminar: Institute for Advanced Simulation, FZ Jülich, Jülich (DE)

2019. *Soft robotic cilia for biomimetic fluid propulsion*. Institute seminar: Department of Physics, University of Milan, Milan (IT)

2017. *Micro and Precision Engineering research at KU Leuven*. Institute seminar: AMOLF, Amsterdam (NL)

2017. *Biomimetic ciliary propulsion*. Group seminar: Micro and Precision Engineering group, KU Leuven, Leuven (BE)

Contributed Presentations ** presenting author; + mentored student*

Ramirez-Agudelo, O. H.*, Antje, A., Schreiber, L., Niemann, N., **Milana, E.**, Hammer, C. (2022). Indoor floorplan estimation from 3D point clouds for Scan-to-BIM. Poster: Image Processing Forum 2022, Karlsruhe (DE)

Milana, E.*, Gorissen, B. (2022). Advances in micromanufacturing of miniaturized elastic inflatable actuators for biomedical applications. Poster: 15th International Workshop on Human-Friendly Robotics, Delft (NL)

Milana, E.*, Peerlinck S., Flaherty S., Reynaerts D., Gorissen B. (2022). Towards half-moon-shaped soft pneumatic cilia. Poster: 5th IEEE International Conference on Soft Robotics (RoboSoft), Edinburgh (UK)

Van Raemdonck, B.*+, **Milana, E.**, De Volder M., Reynaerts D., Gorissen B. (2022). Design for underactuated sequencing of bistable inflatable structures. Oral: APS March Meeting 2022, Chicago (US)

Milana, .E*, Jennen J., Oliveri G., Gorissen B., Overvelde J. T. B., Reynaerts D. (2021). Network theory for morphological control of soft robots. Oral: 25th International Congress of Theoretical and Applied Mechanics, Milan (IT)

Milana, E.*, Stella F., Gorissen B., Reynaerts D., Della Santina C. (2021). Model-Based Control Can Improve the Performance of Artificial Cilia. Poster: 4th IEEE International Conference on Soft Robotics (RoboSoft), New Haven (US)

Milana, E.* (2021). Soft continuum systems in nature and robotics. Pitch: Workshop on Soft continuum systems in nature and robotics at 2021 IEEE RoboSoft, New Haven (US)

Milana, E.*, Van Raemdonck, B., Peerlinck, S., Reynaerts, D., Gorissen, B. (2020). Advances in soft robot actuation and their morphological control. Poster: 20th euspen International Conference and Exhibition, Virtual

Milana, E.*, Van Raemdonck, B., Cornelis, K., Dehaerne, E., De Clerck, J., De Groof, Y., De Vil, T., Gorissen, B., Reynaerts, D. (2020). EELWORM: a bioinspired multimodal amphibious soft robot. Oral: 3rd IEEE International Conference on Soft Robotics (RoboSoft), New Haven (US)

Milana, E.*, Gorissen B., De Volder M., Reynaerts D. (2019). Exploiting mechanical nonlinearities to sequentially inflate multiple soft actuators. Oral: XXIV Congress of the Italian Association of Theoretical and Applied Mechanics (AIMETA), Rome (IT)

Milana, E.*, Bellotti, M., Gorissen, B., De Volder, M., Reynaerts, D. (2019). Precise bonding free micromoulding of miniaturized elastic inflatable actuators. Oral: 2nd IEEE International Conference on Soft Robotics (RoboSoft). Seoul (KR)

Milana, E.*, Gorissen B., De Volder M., Reynaerts D. (2018). Hardware encoded inflation sequence with nonlinear soft actuators. Poster: Solvay Workshop on "Mechanics of slender structures in physics, biology and engineering: from failure to functionality" Brussels (BE)

Bellotti, M.*, **Milana, E.**, Gorissen, B., Qian, J., Reynaerts, D. (2018). Wire electrical discharge grinding of micro rods for bonding-free fabrication of soft pneumatic micro actuators. Poster : 18th euspen International Conference and Exhibition, Venice (IT)

Milana, E.*, Bellotti, M., Gorissen, B., De Volder, M., Reynaerts, D. (2018). Design and characterization of soft microactuators based on interconnected pneumatic networks. Poster : 18th euspen International Conference and Exhibition, Venice (IT)

Gorissen, B.*, **Milana, E.**, Reynaerts, D., De Volder, M. (2018). Lithographic production of vertically aligned CNT strain sensors for integration in soft robotic microactuators. Poster: 1st IEEE International Conference on Soft Robotics (RoboSoft), Livorno (IT)

Milana, E.*, Gorissen B., De Volder M., Reynaerts D. (2018). Design of a bi-segmented soft actuator with hardware encoded quasi-static inflation sequence. Poster: 1st IEEE International Conference on Soft Robotics (RoboSoft), Livorno (IT)

Milana, E.*, Gorissen B., Reynaerts D., De Volder M. (2017). Microfabrication of a biomimetic ciliary propulsion system via soft lithography. Oral: euspen SIG Meeting: Micro/Nano Manufacturing, Glasgow (UK)

Publications

Journal Articles

Milana, E. (2022). Soft robotics for infrastructure protection. *Frontiers in Robotics and AI*, 317

Milana, E., Ramírez-Agudelo, O. H., Estevam Schmiedt, J. (2022). Autonomous Reading of Gauges in Unstructured Environments. *Sensors*, 22 (17)

Milana, E., Gorissen, B., De Borre, E., Ceyssens, F., Reynaerts, D., De Volder, M. (2022). Out-of-Plane Soft Lithography for Soft Pneumatic Microactuators Arrays. *Soft Robotics*

Aubin, C. A., Gorissen, B., **Milana, E.**, Buskohl, P. R., Lazarus, N., Slipher, G. A., Keplinger, C., Bongard, J., Iida, F., Lewis, J. A., Shepherd, R. F. (2022). Towards enduring autonomous robots via embodied energy. *Nature*, 602

Milana, E., Van Raemdonck, B., Bayens, A., De Volder, M., Reynaerts, D, Gorissen, B. (2022). Morphological control of cilia-inspired asymmetric movements using nonlinear soft inflatable actuators. *Frontiers in Robotics and AI*, 8

Piazzoni, M., Piccoli, E., Migliorini, L., **Milana, E.**, Iberite, F., Vannozzi, L., Ricotti, L., Gerges, I., Milani, P., Marano, C., Lenardi, C., Santaniello, T. (2022). Monolithic Three-Dimensional Functionally Graded Hydrogels for Bioinspired Soft Robots Fabrication. *Soft Robotics*, 9 (2)

Milana, E., Zhang, R. Vetrano, M. R., Peerlinck, S., De Volder, M., Onck, P. R., Reynaerts, D., Gorissen, B. (2020). Metachronal patterns in artificial cilia for low Reynolds fluid propulsion. *Science Advances*, 6 (49)

Milana, E., Santaniello, T., Azzini, P., Migliorini, L., Milani, P. (2020). Fabrication of High-Aspect-Ratio Cylindrical Micro-Structures Based on Electroactive Ionogel/Gold Nanocomposite. *Applied Nano*, 1 (1)

Milana, E., Bellotti, M., Gorissen, B., Qian, J., De Volder, M., Reynaerts, D. (2020). Shaping Soft Robotic Microactuators by Wire Electrical Discharge Grinding. *Micromachines*, 11 (7)

Milana, E., Gorissen, B., Peerlinck, S., De Volder, M., Reynaerts, D. (2019). Artificial Soft Cilia with Asymmetric Beating Patterns for Biomimetic Low-Reynolds-Number Fluid Propulsion. *Advanced Functional Materials*, 29 (22)

Gorissen, B., **Milana, E.**, Baeyens, A., Broeders, E., Christiaens, J., Collin, K., Reynaerts, D., De Volder, M. (2019). Hardware Sequencing of Inflatable Nonlinear Actuators for Autonomous Soft Robots. *Advanced Materials*, 31 (3)

Conference Proceedings

Ramirez-Agudelo, O. H., Antje, A., Schreiber, L., Niemann, N., **Milana, E.**, Hammer, C. (2022). Indoor floorplan estimation from 3D point clouds for Scan-to-BIM. In: *Image Processing Forum 2022*

Milana E., Peerlinck S., Flaherty S., Reynaerts D., Gorissen B. (2022) Towards half-moon-shaped soft pneumatic cilia. In: *Proceedings of the 2022 5th IEEE International Conference on Soft Robotics (RoboSoft)*

Milana E., Stella F., Gorissen B., Reynaerts D., Della Santina C. (2021) Model-Based Control Can Improve the Performance of Artificial Cilia. In: *Proceedings of the 2021 4th IEEE International Conference on Soft Robotics (RoboSoft)*

Milana, E., Van Raemdonck, B., Peerlinck, S., Reynaerts, D., Gorissen, B. (2020). Advances in soft robot actuation and their morphological control. In: *European Society for Precision Engineering and Nanotechnology, Conference Proceedings - 20th International Conference and Exhibition*

Milana, E., Van Raemdonck, B., Cornelis, K., Dehaerne, E., De Clerck, J., De Groof, Y., De Vil, T., Gorissen, B., Reynaerts, D. (2020). EELWORM: a bioinspired multimodal amphibious soft robot. In: *2020 3rd IEEE International Conference on Soft Robotics (RoboSoft)*

Milana, E., Bellotti, M., Gorissen, B., De Volder, M., Reynaerts, D. (2019). Precise bonding free micromoulding of miniaturized elastic inflatable actuators. In: *Proceedings of the 2019 2nd IEEE International Conference on Soft Robotics (RoboSoft)*

Bellotti, M., **Milana, E.**, Gorissen, B., Qian, J., Reynaerts, D. (2018). Wire electrical discharge grinding of micro rods for bonding-free fabrication of soft pneumatic micro actuators. In: *European Society for Precision Engineering and Nanotechnology, Conference Proceedings - 18th International Conference and Exhibition*, (413-414)

Milana, E., Bellotti, M., Gorissen, B., De Volder, M., Reynaerts, D. (2018). Design and characterization of soft microactuators based on interconnected pneumatic networks. In: *European Society for Precision Engineering and Nanotechnology Conference Proceedings - 18th International Conference and Exhibition*, (209-210)

Gorissen, B., *Milana, E.*, Reynaerts, D., De Volder, M. (2018). Lithographic production of vertically aligned CNT strain sensors for integration in soft robotic microactuators. In: *2018 IEEE International Conference on Soft Robotics, RoboSoft 2018*, (400-405)

Milana, E., Gorissen, B., De Volder, M., Reynaerts, D. (2018). Design of a bi-segmented soft actuator with hardware encoded quasi-static inflation sequence. In: *2018 IEEE International Conference on Soft Robotics, RoboSoft 2018*, (108-113)

Book Chapters and Dissertations

Milana, E., Reynaerts, D. (sup.), Gorissen, B. (cosup.), De Volder, M. (cosup.) (2020). Biomimetic Ciliary Propulsion: Soft Robotic Actuation and Morphological Control. *PhD Dissertation*

Gorissen, B., **Milana, E.**, De Volder, M., Reynaerts D. (2018) Artificial Pneumatic Cilia. *Atlas of Cilia Bioengineering and Biocomputing*, 61

Languages

Italian, Native
English, Advanced
German, Intermediate
French, Intermediate